Surface and Groundwater Hydrology Evaluation
Chevron Orlando Site
Orlando, Florida

Ardaman & Associates, Inc.

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Ardaman & Associates, Inc.

Geotechnical Services
Materials Engineering

March 9, 1995
File Number 94-146

Task Environmental
5408 Boran Place
Tampa, Florida 33610

Attention: Ms. Susan Tobin

Subject: Surface and Ground Water Hydrology Evaluation, Chevron Orlando Site, U.S. Highway 441 near Silver Star Road, Orlando, Florida

Dear Ms. Tobin:

As requested and authorized by you, Ardaman & Associates, Inc. has completed an evaluation of the surface and ground water hydrology at the subject site to develop a better understanding of the recent high water table conditions at and runoff from the site. Periods of standing water and some runoff from the site, north to an adjacent trailer park were the focus of these evaluations. Our scope of work included an evaluation of the historic rainfall and runoff conditions at the site and an analysis of the potential for future runoff from the site.

The evaluation of historic rainfall, groundwater level and runoff data documented a condition of extraordinary high rainfall at the site prior to the 1994 runoff events. No runoff was documented in the preceding 10-year period when rainfall was at or about normal conditions. The changes in runoff potential from the site after the 1993 Chevron remediation work effort were also evaluated to make an initial assessment of the long-term potential for runoff from the site to determine whether or not the site remediation work could have resulted in any increased potential for runoff from the site.

Site Location

The site is located in Section 15, Township 22 South, Range 29 East approximately at the corner of Silver Star Road and U.S. Highway 441 in Orlando, Florida. The south edge of the site is approximately 300 feet north of Silver Star Road. The east edge of the site is adjacent to U.S. Highway 441. The site is approximately 300 feet wide by 650 feet long as shown on Figure 1. The subject trailer park sits directly north of the site and is also shown on Figure 1.

Site Conditions

Available topographic maps for the project area include the 1956 U. S. Geological Survey (USGS) Quadrangle map at a scale of 1 inch to 2,000 feet (Figure 1), a June 1981 St. Johns River Water Management District (SJRWMD) and Orange County aerial topographic map at a scale of 1 inch to 200 feet, a June 1991 Tribble & Richardson, Inc. map at a scale of 1 inch to 30 feet, an October 1991 Donaldson, Garrett & Associates, Inc. map at a scale of 1 inch to 30 feet and a December 1992 Brown & Caldwell site drainage map at a scale of 1 inch to 30 feet.

Each map shows different site conditions and different areas, and has different topographic precision.

The USGS map is of little value in assessing runoff potential from the site because of the scale and precision of the mapping considering the flat topography within this small area including the trailer park to the north. The land surface elevations are only shown at 10-foot contour intervals. The topographic map is based on a field survey completed in 1956. Based on the USGS quadrangle map, the land surface elevations within the east half of the site and the trailer park are higher than 100 ft (NGVD). No other elevation information such as spot elevations is available for the two sites. The nearest 90 ft (NGVD) contour is east of U.S. Highway 41 at Big Lake Fairview. The water level elevation in the lake was 88 ft (NGVD) in 1956.

Figure 2 shows the topography of the site and the trailer park in June 1981. The land surface elevations at the two sites ranged between 101.1 and 95.5 ft (NGVD). The highest land surface elevations were along the east side of the Chevron site and at the southeastern portion of the trailer park site. The land surface elevations for the Chevron site were higher than 98 ft (NGVD) except in the northwest portion of the site. Any potential surface runoff from most of the subject site would have to move west and north to the northwest corner of the property. A small area above 101 ft (NGVD), on the east side of the site, would drain to the roadside swale along U.S. Highway 441. The lowest land surface elevation on the Chevron site is approximately 97.5 ft (NGVD) and is located at the northwest corner of the site.

The western one-third of the trailer park property had land surface elevations lower than 97 ft (NGVD). The northwest part of the trailer park site had land surface elevations lower than 96 ft (NGVD). The overland flow pattern for the trailer park property is west and north except along the extreme east edge of the property which drains east to the highway swale. A drainage swale is obvious within the west part of the trailer park property.

Figure 3 shows the topography of the site in June 1991 according to the Tribble & Richardson, Inc. map. This map shows the Chevron site conditions in greater detail. No land surface elevations are available for the trailer park property. The land surface elevations for the Chevron site ranged between 101.8 and 96.0 ft (NGVD). Most of the site had an elevation higher than 99.0 ft (NGVD). A depression and a short east-west ditch are the only places within the site where the land surface elevations were lower than 98 ft (NGVD). At the northwest corner of the site, surface water, if present, would overflow to the trailer park property at approximately 98 ft (NGVD). A Donaldson, Garrett & Associates, Inc. map prepared in October 1991 appears to show the same topographic information for the subject site as the June 1991 Tribble & Richardson map.

In the Brown and Caldwell Removal Action Report dated December 17, 1992, a site drainage features map shows the land surface elevations ranging between slightly higher than 101 ft (NGVD) and slightly lower than 98 ft (NGVD). This map generally has the same land surface elevation contours as the above-mentioned June 1991 topographic map. In other words, the land surface elevations after remediation have not been significantly altered from the conditions prior to remediation. However, no recent topographic survey of the site was available to verify this conclusion.

Hydrologic Conditions

Hydrologic conditions were evaluated from several different data sources. The rainfall records at Orlando International Airport were evaluated to compare the 1994 rainfall setting to normal rainfall patterns. The nearest long term lake hydrograph data were also reviewed to assist in discerning the hydrologic setting for the site. In addition, water table elevations at the site have been documented by various investigators since July 1981.

Rainfall

Table 1 summarizes the Orlando monthly rainfall records between 1960 and 1994. The highest annual rainfall occurred in 1960 (68.74 inches) while the 1994 rainfall was 68.66 inches. The highest lake levels in the recent past were in August-September 1960, at the end of a rainy period that included rainfall associated with Hurricane Donna. The normal monthly rainfall values representing the averages for the 1961-90 period are summarized in Table 2.

Figure 4 summarizes the rainfall record as a graph of cumulative departure from normal rainfall. The graph was generated using the measured monthly rainfalls and the normal monthly rainfall for the 1961-90 period. Above average monthly rainfall was considered positive and below average monthly rainfall was considered negative. The slope of the graphed line is the important feature. Extended periods of below normal rainfall are indicated by a negative slope (i.e., downward trend on the graph). For example, the 1974 to 1982 period was an extremely dry period. The cumulative rainfall between June 1974 and August 1981 was 25.5 inches below normal amounts. Periods of above average rainfall are indicated by a positive slope (i.e., upward trend on the graph). Between February 1991 and December 1994, cumulative rainfall exceeded the normal rainfall amounts by 36.58 inches. The cumulative departure rainfall data are included in Appendix A.

Big Lake Fairview Water Levels

Water levels have been monitored in Big Lake Fairview since July 1959. Lake Fairview is less than 0.5 miles northeast of the site. An overflow weir was constructed at 88.0 ft (NGVD) to control water level fluctuations in the lake. Figure 5 summarizes the Orange County water level records for this lake. The highest water level elevation documented was 90.22 ft (NGVD) in July 1974. According to Orange County Public Works Department, the normal high water elevation is 88.5 ft (NGVD). The water level elevation has equalled or exceeded 88.97 ft (NGVD) in August and September 1960, August 1973, July 1974, and September 1994 based on the readings obtained by Orange County Public Works Department personnel.

Water Table Elevations

Water table elevations across the site have been documented by various investigators during August 1981, May 1982, October 1990, October 1991, September 1993 and December 1994. Surface water is the expression of the water table above land surface. Figures 6 through 11 show these water table data. The water table elevations ranged between 95.8 and 88.9 ft (NGVD). The highest water table elevations are within the southwest corner of the site and the lowest water table elevations are within the northeast corner of the site. The direction of ground water flow is to the northeast at a hydraulic gradient of about 0.005, i.e. three feet in 600 feet. The water table elevations in 1981 and 1982 are approximate elevations as the elevations were based on an assumed datum of 100 feet elevation for the top of a valve nut on a fire hydrant

located at the northwest corner of the truck facility building. These elevations should be within one foot of actual elevations based on review of the site topographic maps.

The highest water table elevation typically occurs at the end of the rainy season and not necessarily during the month of highest rainfall. Typically this occurs in August-September in a normal rainfall year. However, in any particular year, normal rainfall conditions may not exist. Similarly, the lowest water table elevation occurs at the end of the dry season and not necessarily during the month of lowest rainfall. Typically the end of the dry season is April-May. The water table elevations at any site within the property typically fluctuate about three feet in a given year. During long term monitoring, the range in elevation of the water table can exceed 5 feet. For example, the USGS Cocoa-K Well near Bithlo (Well 282847081013702) water table fluctuation between August 1968 and September 1991 was approximately 5.0 feet.

The water table at all monitoring wells ranged from about 2.5 feet to 12 feet below land surface during the six periods when the water table elevations were documented (Figures 6-11). The water table generally was deepest in August 1981 and relatively close to the surface in December 1994. In a normal rainfall year the water table probably is 6 to 9 feet deep at the end of the dry season and 3.5 to 6.5 feet deep at the end of the rainy season. At the site, borings by others have documented about 33 feet of permeable sands on top of a relatively impervious clay layer. The subsurface soils can store excess rainfall (rainfall minus evapotranspiration). Approximately three inches of excess rainfall can be stored in one foot of soil.

Water Balance Considerations

Runoff can occur from the Chevron site either when the soil becomes saturated or when the rainfall intensities exceed the infiltration capacity of the surface soil. The infiltration capacity of the surface sandy soil is about 6 to 20 inches per hour considering rates typical of Orange County surficial soils as reported by the U.S. Soil Conservation Service in their Soil Survey. Runoff will always occur from impervious areas but may not leave the site if it can infiltrate into permeable portions of the site creating a temporary mound of the water table.

Runoff, in the water balance equation, equals rainfall minus evapotranspiration minus groundwater outflow plus groundwater inflow plus or minus change in groundwater storage. A monthly water balance computation was performed to estimate periods of runoff between January 1981 and December 1994 (the period of available water table elevation data). The spreadsheet model was based on the known water table elevations in the northwest corner of the property, the Orlando International Airport rainfall record, estimates of evapotranspiration for fair grass for the Orlando area and calculated groundwater seepage values from the known water table elevation data.

The results of the computed water table elevations between December 1994 to January 1981 are shown on Figure 12. The groundwater seepage and evapotranspiration (ET) terms were adjusted within reasonable limits to produce the best fit of the water table elevation data. The cover between September 1993 and December 1994 was considered good grass with no impervious areas. Between January 1992 and September 1993 was considered the lowest ET period because of maximum site imperviousness and remediation activities. During the remaining period ET was considered in between these two extreme conditions. Seepage was calculated as a function of water table elevations and averaged about 17 inches during the study period. Runoff was considered to occur in months when the water table elevation was calculated above 97.5 ft (NGVD) and occurred in June, July and September 1994. Total runoff was 2.7

inches during these three months. The rainfall during 1994 was 68.66 inches, the highest annual amount since 1960.

The runoff potential of the site has changed over the years. Presently the site has no impervious area. In 1991 the impervious area was about 42 percent of the site based on the detailed site topographic maps. Therefore, the potential for runoff was greatest when imperviousness was the highest.

The U.S. Army Engineer Waterway Experiment Station HELP Model (U.S. Army Corps of Engineers Waterways Experiment Station, 1994) was used to compute the amount of runoff at the site under the 1994 land cover conditions. This analysis was performed to determine the amount of runoff generated on the property in the future considering a fair grass cover and no impervious areas. The 1958 through 1980 Orlando daily rainfall record was input for this model because this record was readily available in our library. The HELP model solves the water balance equation on a daily basis. Runoff exceeded one inch per year in only 1960 and 1968, 1.8 and 1.2 inches per year, respectively. In 1960 runoff was 0.22 inches in March and 1.55 inches in July. The annual rainfall in 1960 was 68.74 inches. In 1968 with an annual rainfall of 52.10 inches, runoff was 1.2 inches in June with 18.28 inches of rainfall, approximately 11 inches above normal for June. Four other years (1964, 1972, 1973 and 1974) had runoff less than one inch but greater than 0.1 inch per year but less than one inch per year during the 1958 through 1980 period.

Conclusions and Recommendations

Since January 1960, extended wet periods have occurred in July to September 1960, May to September 1966, December 1969, March 1970, August to September 1973, June to July 1974, November 1988 and July to December 1994 based on evaluation of rainfall and lake level records. The total rainfall in Orlando between February 1991 and December 1994 exceeded the normal rainfall amounts by 36.58 inches. In the fall of 1994, the lake levels in many of the area lakes were equal to or higher than the September 1960 levels, typically the highest of record. Runoff from the site most likely occurred at the end of these wet periods. Runoff probably did not occur at the site in most of the past years back to 1960.

The runoff potential for the site has changed over the years with the amount of impervious area. Today, the site has essentially no impervious area. However, in 1991, just prior to site remediation, the percent of impervious area was approximately 42 percent based on the detailed site topographic maps. Runoff would be more likely from the site when the impervious area was this high.

Water table elevations documented during dry periods such as August 1981 and May 1982 may have provided a sense of false security with respect to possible runoff conditions. The 1974 to 1982 period was extremely dry. Between June 1974 and August 1981, the cumulative rainfall was 25.5 inches below normal rainfall amounts. The last extended dry period was between January 1989 and February 1991. The cumulative rainfall during this period was 22.4 inches below normal rainfall amounts by February 1991.

The historic land surface elevations documented in June 1981 from the SJRWMD and Orange County topographic map indicate conclusively that runoff naturally drained to the low land within the west third of the trailer park complex. The land surface elevations were highest, 101 ft (NGVD), at the east edge of the two sites and gradually sloped down from the south to the north.

The lowest land surface elevation on the Chevron site was approximately 97.5 ft (NGVD). The lowest land surface elevations on the trailer park site were between 95 and 96 ft (NGVD). From this map (Figure 2), an obvious south to north and east to west depression or drainage swale was evident within the west part of the trailer park property.

The water table maps do not indicate a water table elevation above land surface. We know that runoff occurred in 1994 because a berm was installed in the northwest corner of the site and ponded water existed behind this berm in September during a site inspection. The monthly water balance evaluation between January 1981 and December 1994 indicates that runoff from the site occurred only in three months in 1994.

It is our opinion that a runoff control program is not necessary at this site because runoff is not expected to occur in most years. Runoff in the past occurred only after extended above normal rainfall conditions even with 42 percent of the site being impervious. Recently, the site is totally pervious and a grass cover is established over the site, the potential for runoff is even less than under past conditions. A grass cover has higher rates of evapotranspiration than under historic site conditions. Runoff previously occurred when annual rainfall was over 68 inches, approximately 20 inches above normal. We predict that runoff should not occur unless annual rainfall is 68 inches or as in June 1968 when rainfall was 18.28 inches, approximately 11 inches above normal for June. Therefore, runoff from the Chevron site should not occur most of the time. The quality of the runoff, should it occur, is background conditions now as no surface contamination source(s) are present at the site. Furthermore, the historic maps show that runoff naturally occurred to the north at the northwest corner of the property.

We recommend that a site topographic map with at least a one-foot contour interval document post-remediation land surface elevations. Quarterly monitoring of the groundwater levels is recommended for the period to verify the low water table conditions and lack of runoff conditions.

The evaluations presented in this report have been prepared for the exclusive use of Task Environmental and Chevron for specific application to the subject facility in accordance with generally accepted hydrogeological and water resources engineering practice. No other warranty, expressed or implied, is made.

It has been a pleasure assisting you on this phase of the project. Please do not hesitate to contact the undersigned if you have any questions or when we can be of further assistance.

Very truly yours,
ARDAMAN & ASSOCIATES, INC.

Herbert G. Stangland, Jr., P.E.
Senior Water Resources Engineer
Florida Registration No. 16713

John E. Garlanger, Ph.D., P.E.
Principal

HGS/jcw
Enclosures

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Table 1

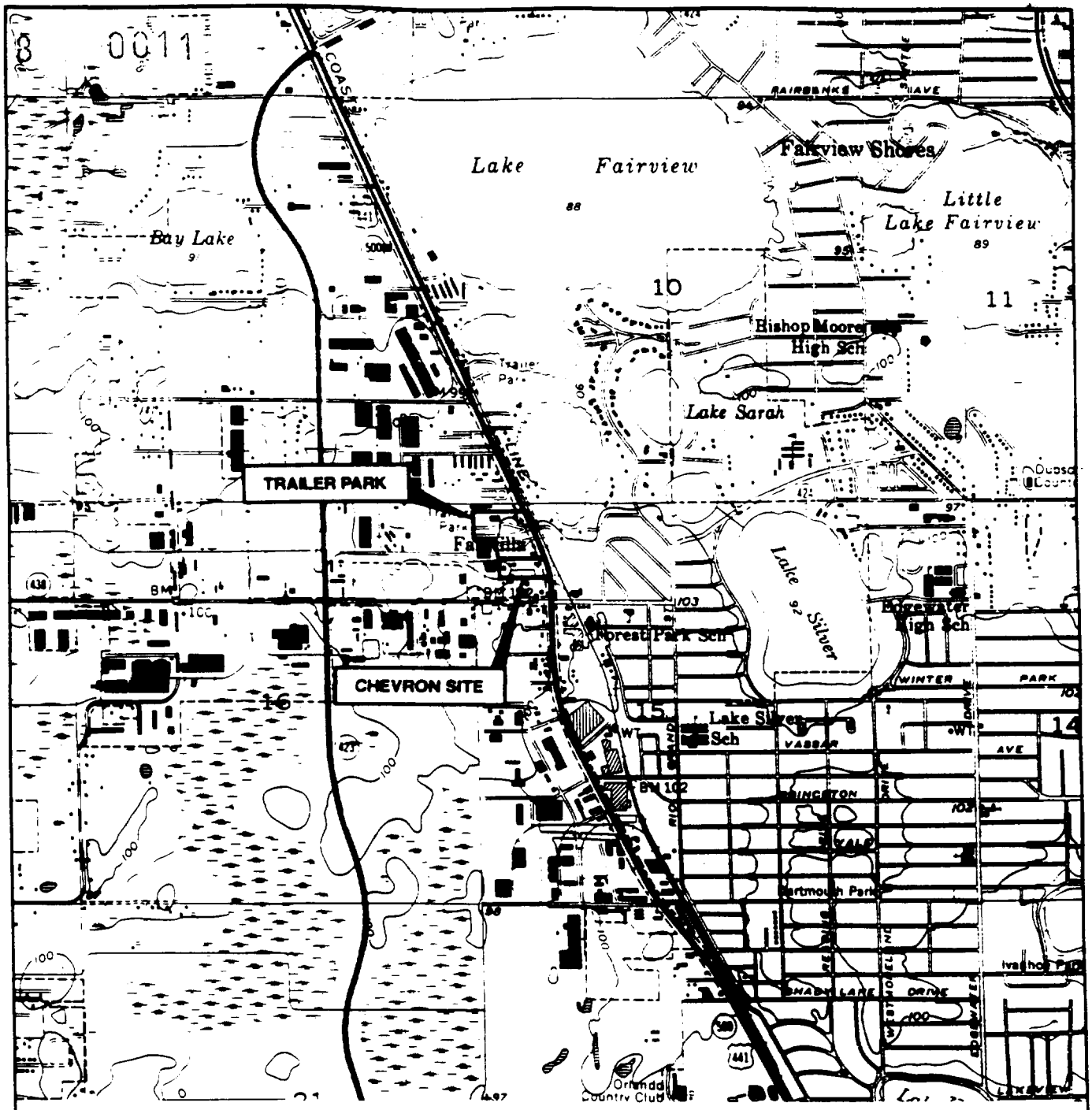
ORLANDO INTERNATIONAL AIRPORT MONTHLY RAINFALL BEGINNING 1960
(inches)

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total
1960	1.49	5.64	10.54	2.55	0.50	9.50	19.57	3.20	11.21	3.17	0.30	1.07	68.74
1961	1.75	2.82	2.21	0.28	0.43	8.08	9.93	6.99	4.84	2.87	0.92	0.66	41.78
1962	1.11	2.08	3.55	1.58	2.74	3.11	12.77	5.11	12.24	1.90	2.46	1.70	50.35
1963	3.17	4.76	2.69	1.23	3.56	6.67	3.83	3.54	6.72	0.46	6.39	2.26	45.28
1964	6.18	3.42	4.65	2.14	2.74	6.11	6.68	9.00	9.47	1.64	0.45	1.91	54.39
1965	1.79	3.67	3.02	0.66	0.52	7.36	11.55	5.49	5.99	4.06	1.06	2.23	47.40
1966	4.45	6.31	2.57	1.92	6.57	9.77	6.73	7.76	6.25	1.98	0.09	0.99	55.39
1967	0.84	5.49	1.31	0.28	1.69	11.16	4.63	6.83	5.88	0.35	0.03	2.42	40.91
1968	0.65	2.76	2.27	0.30	3.72	18.28	5.60	3.44	5.91	5.47	2.82	0.88	52.10
1969	2.22	3.30	5.52	2.38	1.40	5.04	6.73	7.17	6.44	9.45	0.87	4.66	55.18
1970	4.05	6.77	3.66	0.45	4.08	4.92	5.97	5.91	3.25	2.60	0.24	2.06	43.96
1971	0.45	2.98	1.46	1.52	4.31	4.39	8.29	7.51	2.98	3.06	1.21	1.93	40.09
1972	0.99	4.96	5.06	1.39	3.76	6.33	3.98	16.11	0.43	2.34	4.11	1.89	51.35
1973	4.82	2.73	4.13	2.82	4.74	6.63	6.24	7.33	11.53	1.10	0.74	2.56	55.37
1974	0.16	0.63	3.67	1.17	2.69	15.28	6.01	6.56	5.78	0.48	0.31	1.62	44.36
1975	0.98	1.49	1.10	1.36	7.52	9.70	9.26	4.75	4.97	4.74	0.66	0.51	47.04
1976	0.37	0.83	1.72	2.16	10.36	9.93	7.05	3.25	5.87	0.74	2.03	2.77	47.08
1977	1.81	1.76	1.82	0.14	1.47	4.47	6.61	6.28	7.03	0.43	2.60	3.70	38.12
1978	2.49	5.45	2.14	0.61	3.16	10.00	11.92	5.13	4.31	1.51	0.18	3.69	50.59
1979	6.48	1.45	3.24	1.08	7.66	4.00	7.95	5.88	9.19	0.43	1.93	0.94	50.23
1980	2.45	1.64	1.51	4.07	6.96	5.25	5.14	2.92	3.70	0.55	6.55	0.47	41.21
1981	0.21	4.36	1.85	0.18	2.02	12.49	3.53	5.60	8.26	3.13	2.50	2.97	47.10
1982	1.72	1.34	4.85	6.27	5.29	6.06	11.81	5.03	6.96	0.74	0.53	1.01	51.61
1983	2.08	8.32	5.37	3.21	1.74	7.54	6.38	4.71	5.16	3.78	1.36	5.34	54.99
1984	2.01	2.73	1.85	6.21	3.20	5.28	6.19	7.89	6.12	0.56	2.10	0.19	44.33
1985	0.91	1.27	4.59	1.69	3.00	4.54	7.28	11.63	5.45	2.55	0.82	3.46	47.19
1986	7.23	1.84	2.63	0.49	0.88	9.50	5.85	5.99	4.50	5.63	1.69	3.60	49.83
1987	1.27	1.74	11.38	0.59	1.40	3.54	7.95	6.07	8.64	3.41	10.29	0.51	56.79
1988	3.12	1.38	6.07	2.02	2.82	4.17	9.44	7.94	5.67	1.42	7.44	1.00	52.49
1989	3.80	0.15	1.35	2.28	2.38	6.79	4.74	6.20	10.29	1.75	1.44	4.49	45.66
1990	0.23	4.13	1.92	1.73	0.55	6.22	6.68	3.78	2.46	2.10	1.05	0.83	31.68
1991	2.37	0.98	6.66	7.72	9.48	5.98	10.78	7.13	4.53	4.76	0.27	0.24	60.90
1992	1.35	2.42	3.67	9.10	1.19	8.68	2.60	8.03	7.13	5.17	2.74	0.88	52.96
1993	4.89	1.48	6.26	1.78	2.32	4.47	6.49	5.95	5.35	4.61	0.17	0.76	44.53
1994	4.00	3.58	1.21	3.03	2.87	10.28	13.27	6.23	7.84	5.18	7.32	3.85	68.66
Average	2.40	3.05	3.64	2.18	3.42	7.47	7.70	6.35	6.35	2.69	2.16	2.00	49.42

Table 2

Normal Rainfall for Orlando
(1961-1990)

Month	Amount (inches)
January	2.30
February	3.02
March	3.21
April	1.80
May	3.55
June	7.32
July	7.25
August	6.78
September	6.01
October	2.42
November	2.30
December	2.15
Total	48.11



SITE LOCATION MAP

TOWNSHIP 22 SOUTH
RANGE 28 EAST
SECTION 15

OBTAINED FROM U.S.G.S. QUAD MAP: ORLANDO WEST, FLORIDA 1956
(PHOTOREVISED 1980)

NORTH

0 1000 2000

SCALE — FEET

N:\2684

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

HYDROLOGY EVALUATIONS
CHEVRON ORLANDO
TASK ENVIRONMENTAL

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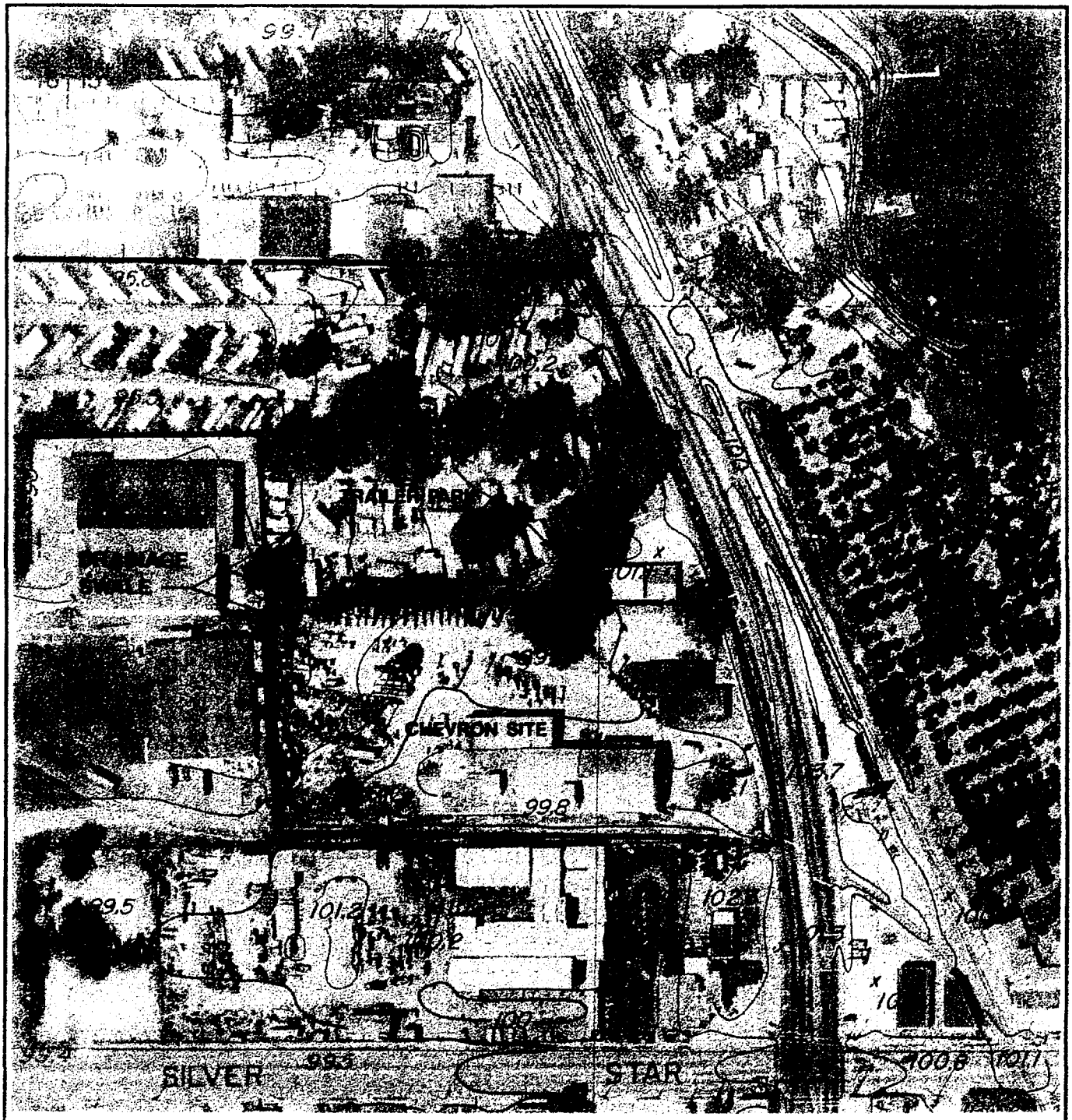
SEF	HDS	12/30/94
FILE NO. 94-146	APPROVED BY H. Stanglund	FIGURE 1



JUNE 1981 TOPOGRAPHIC MAP

NORTH

0 100 200

SCALE —— FEET

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HYDROLOGY EVALUATIONS
CHEVRON ORLANDO
TASK ENVIRONMENTAL

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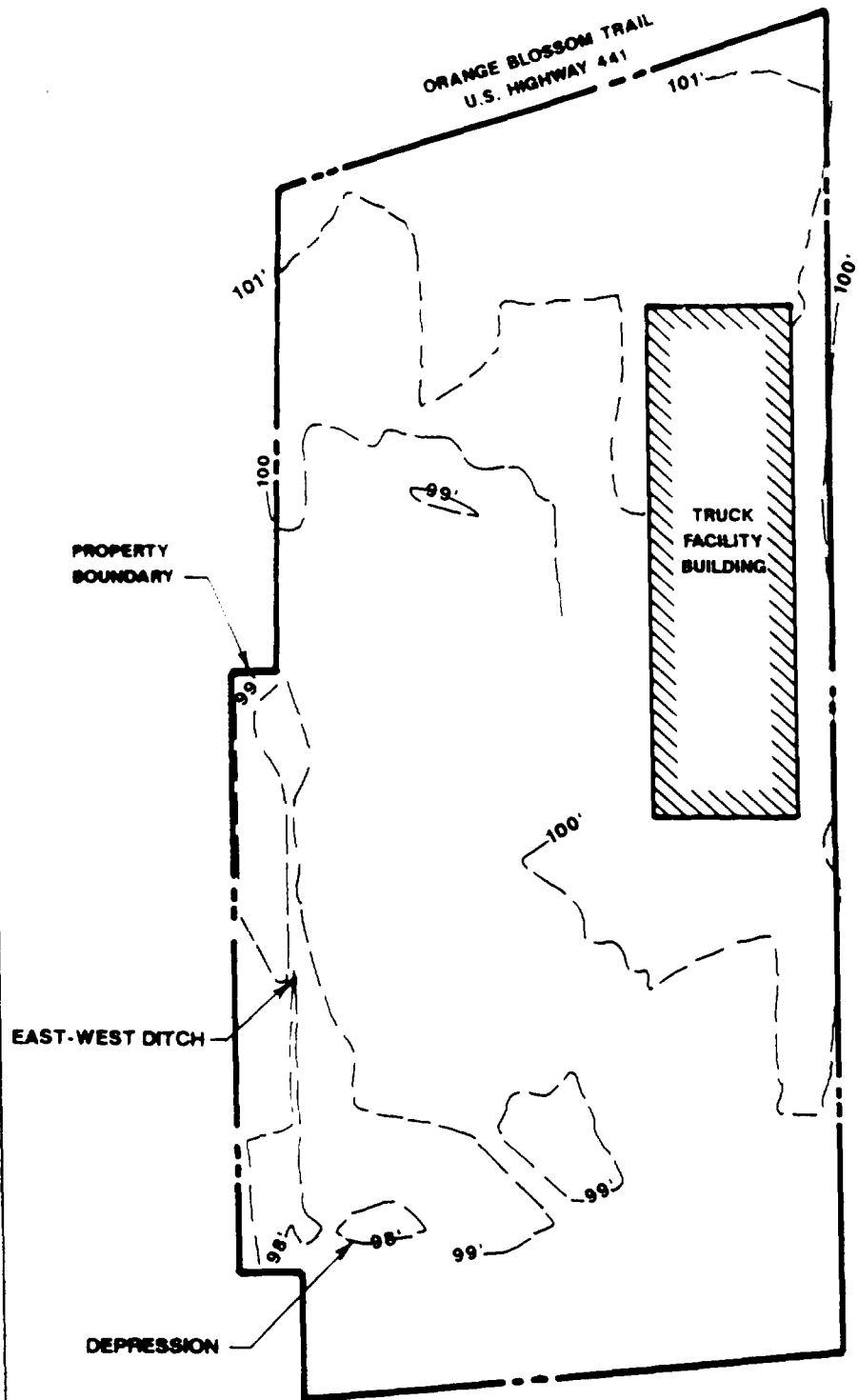

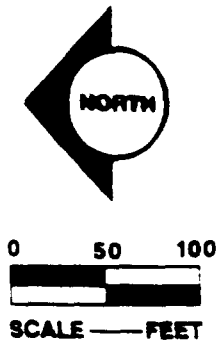

LEGEND

–98'– WATER TABLE SURFACE CONTOUR

GENERALIZED JUNE 1991 TOPOGRAPHIC MAP

BROWN CALDWELL, 1990

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HYDROLOGY EVALUATIONS
CHEVRON ORLANDO
TASK ENVIRONMENTAL

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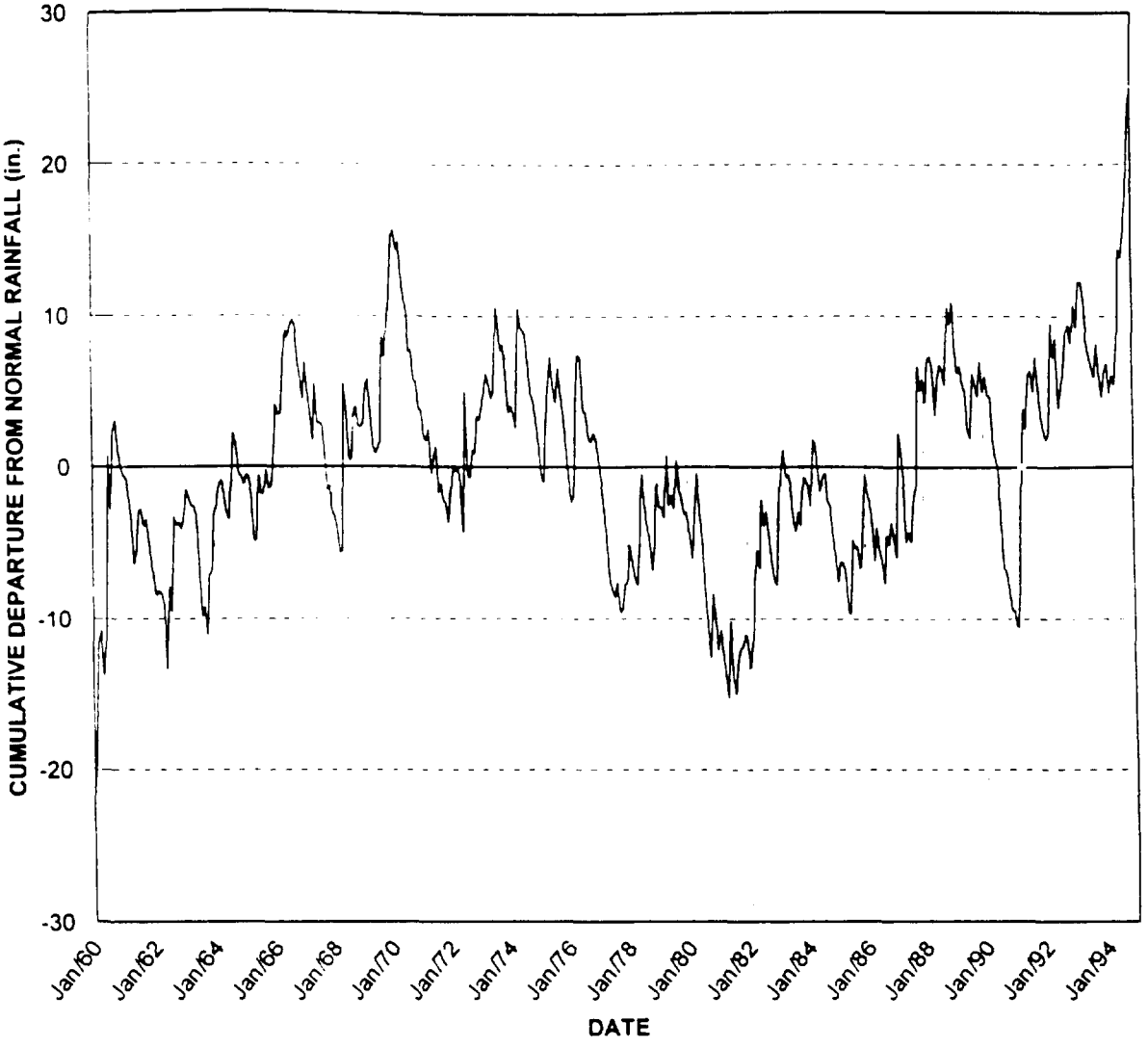

CUMULATIVE DEPARTURE FROM NORMAL RAINFALL: ORLANDO (1960-1994)

Ardaman & Associates, Inc.
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HYDROLOGY EVALUATIONS
CHEVRON ORLANDO
TASK ENVIRONMENTAL

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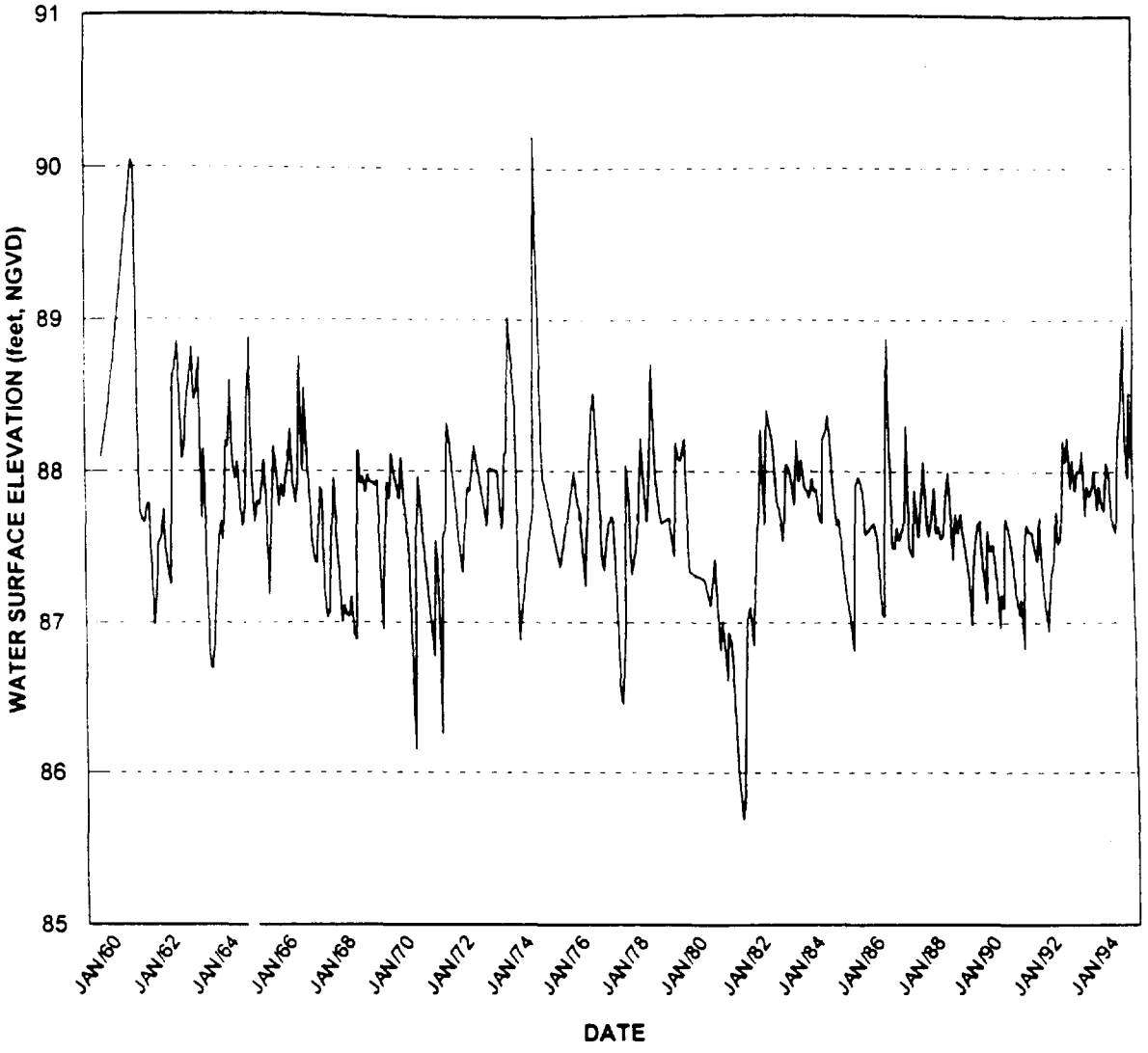
CAC		23/FEB/1996

FILE NO	APPROVED BY	FIGURE
94-146		4

3 8 0015



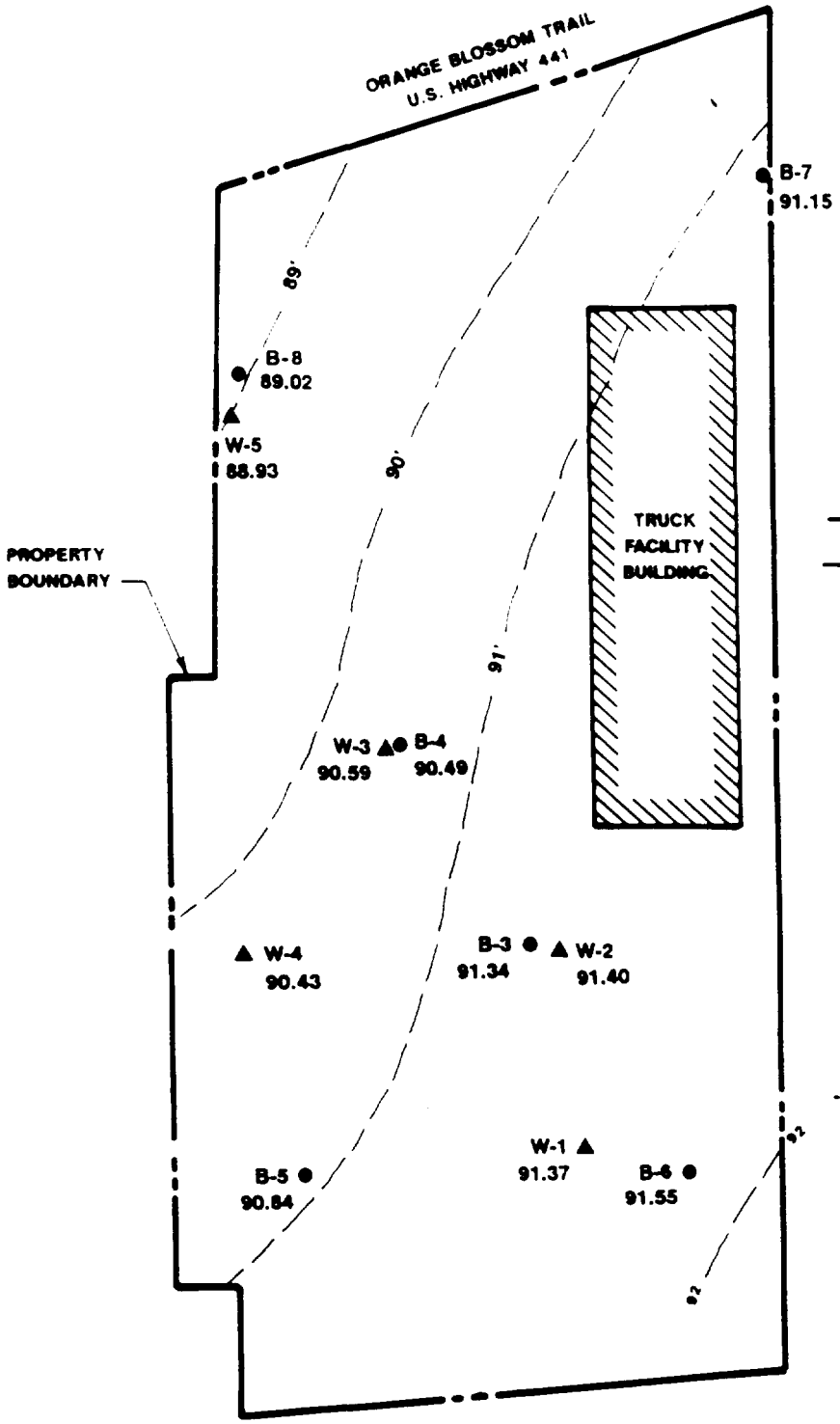
WATER SURFACE ELEVATION OF BIG LAKE FAIRVIEW (1959-1994)

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

HYDROLOGY EVALUATIONS
CHEVRON ORLANDO
TASK ENVIRONMENTAL

DRAWN BY	CAC	CHECKED BY	HGS	DATE	3/FEB/1995
FILE NO	94-146	APPROVED BY	H. Stanglund	FIGURE	5

3 8 0016



WATER TABLE ELEVATION MAP
AUGUST 1981

DAMES AND MOORE, 1983

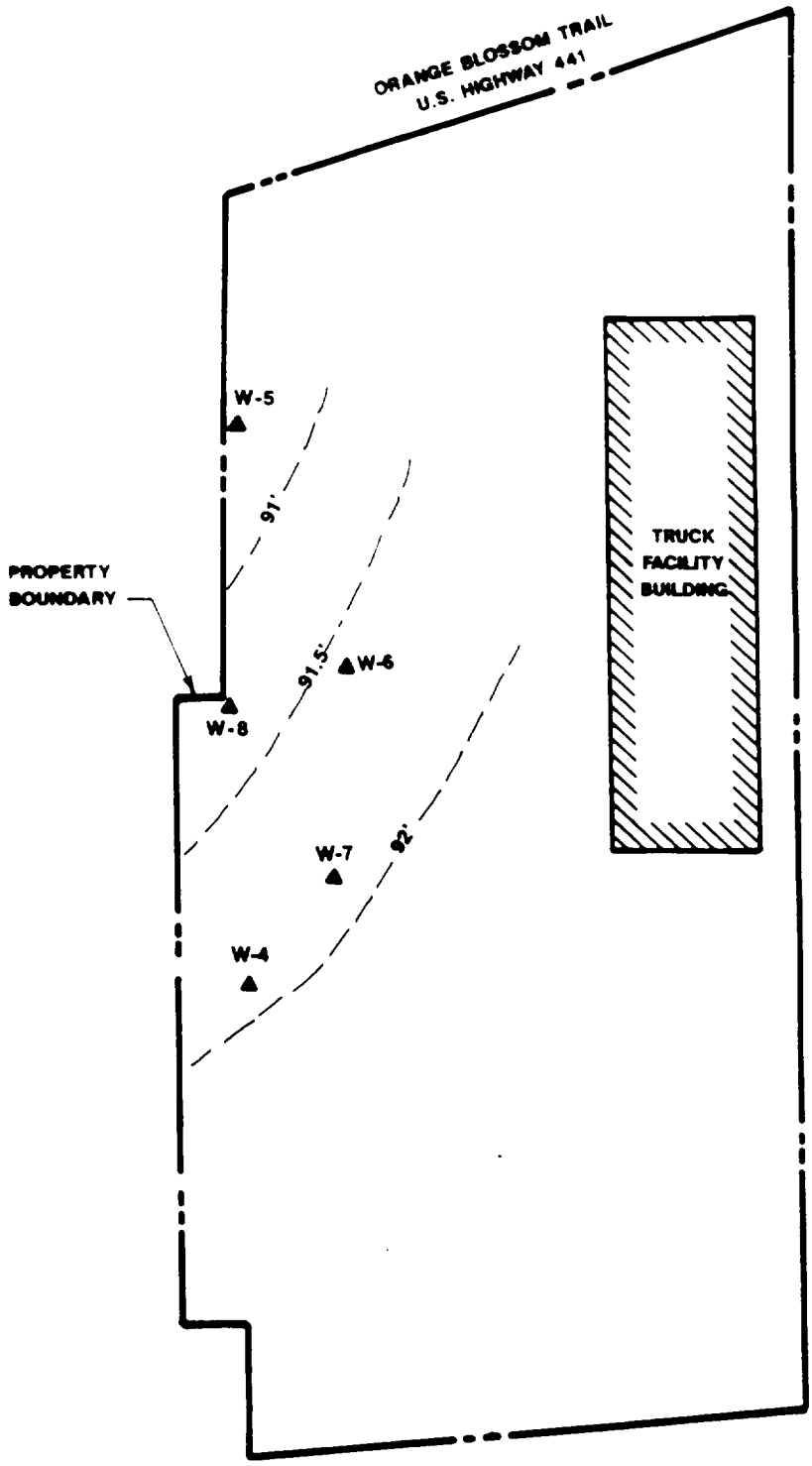
Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

HYDROLOGY EVALUATIONS
CHEVRON ORLANDO
TASK ENVIRONMENTAL

DRAWN BY SEF CHECKED BY HS DATE 12/30/94
FILE NO. 94-146 APPROVED BY H. Stang and FIGURE 6

N22684

3 8 0017



WATER TABLE ELEVATION MAP
MAY 1982

DAMES AND MOORE, 1983

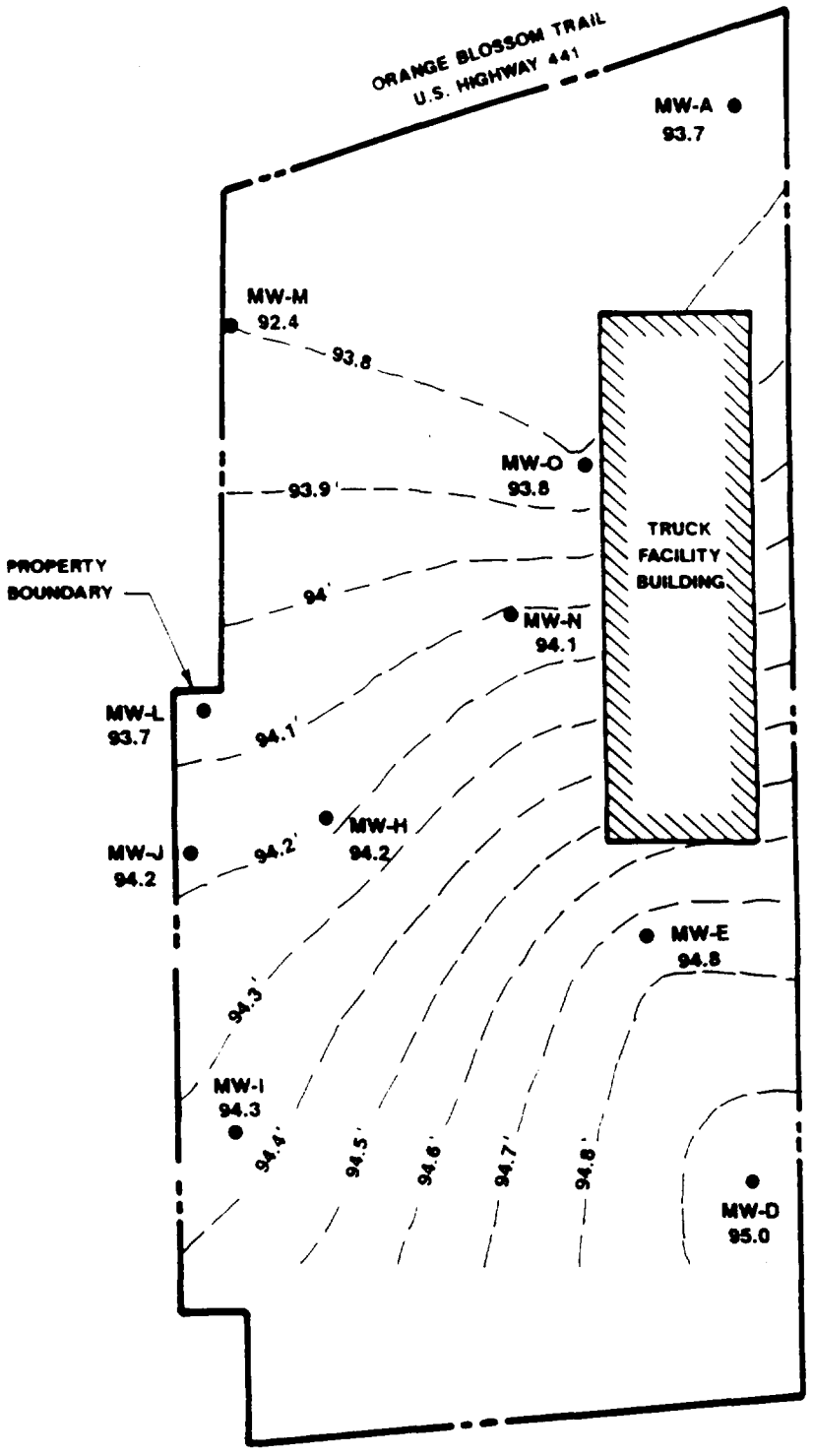
Ardaman & Associates, Inc.
Geotechnical Environmental and Materials Consultants

HYDROLOGY EVALUATIONS
CHEVRON ORLANDO
TASK ENVIRONMENTAL

DRAWN BY	CHECKED BY	DATE
SEF		12/30/94

FILE NO.	APPROVED BY	FIGURE
94-146		7

3 8 0018



LEGEND

- 94' – WATER TABLE SURFACE CONTOUR
- ● OCTOBER 15, 1990 WATER LEVEL MONITORING SITE

WATER TABLE ELEVATION MAP
OCTOBER 1990

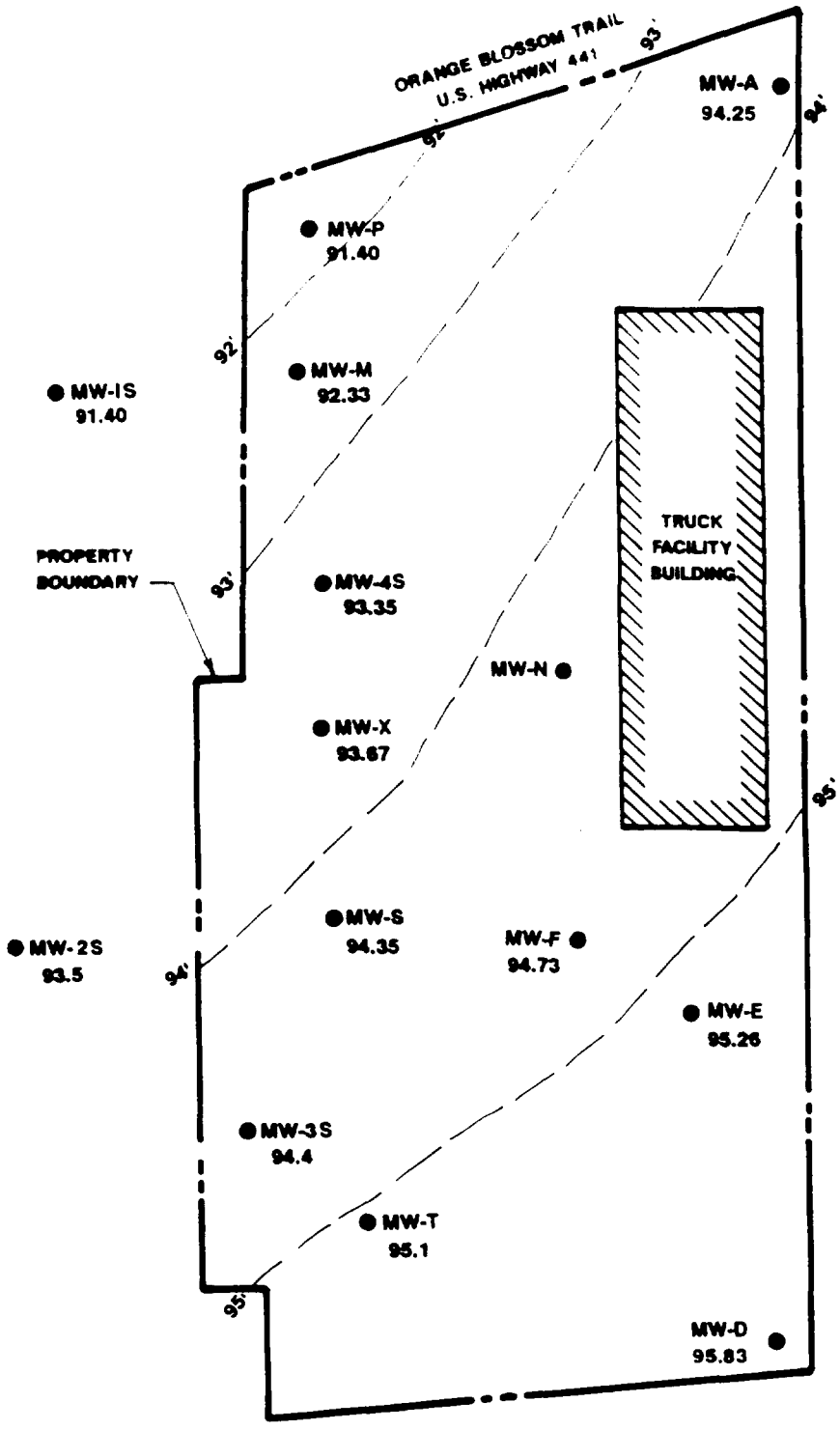
BROWN AND CALDWELL, 1990

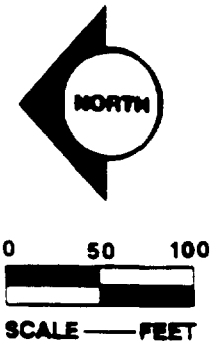
Ardaman & Associates, Inc.
Geotechnical Environmental and Materials Consultants

HYDROLOGY EVALUATIONS
CHEVRON ORLANDO
TASK ENVIRONMENTAL

SEF | 12/30/94
94-146 | 8

3 8 0019





LEGEND

— 92' — WATER TABLE SURFACE CONTOUR

● WATER LEVEL MONITORING SITE

WATER TABLE ELEVATION MAP
OCTOBER 1991

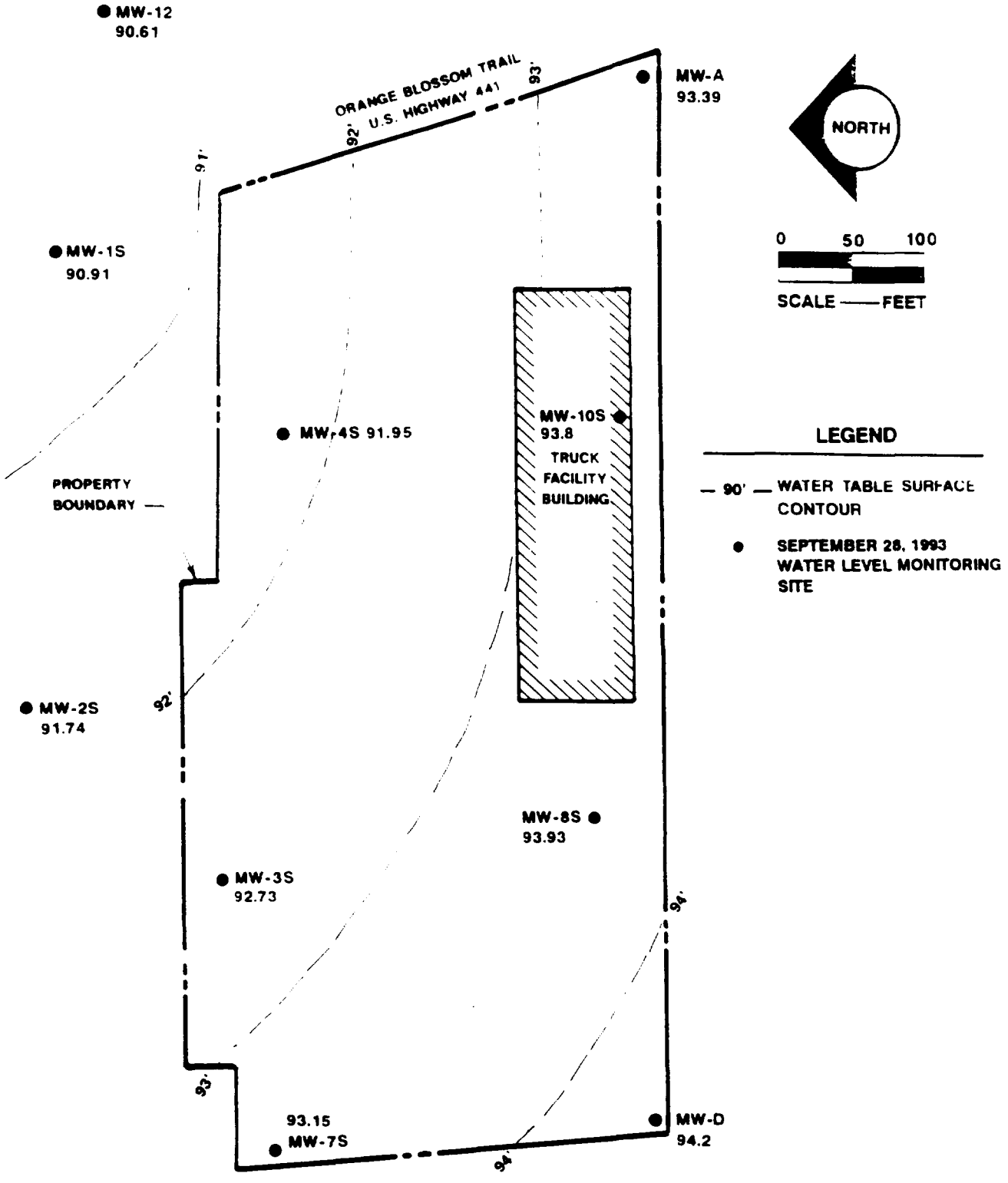
BROWN AND CALDWELL, 1992

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

HYDROLOGY EVALUATIONS
CHEVRON ORLANDO
TASK ENVIRONMENTAL

DRAWN BY SEF | CHECKED BY HLS | DATE 12/30/94
FILE NO. 94-146 | APPROVED BY HLStang (ME) | FIGURE 9

3 8 0020



WATER TABLE ELEVATION MAP
SEPTEMBER 1993

Ardaman & Associates, Inc.
Geotechnical Environmental and Materials Consultants

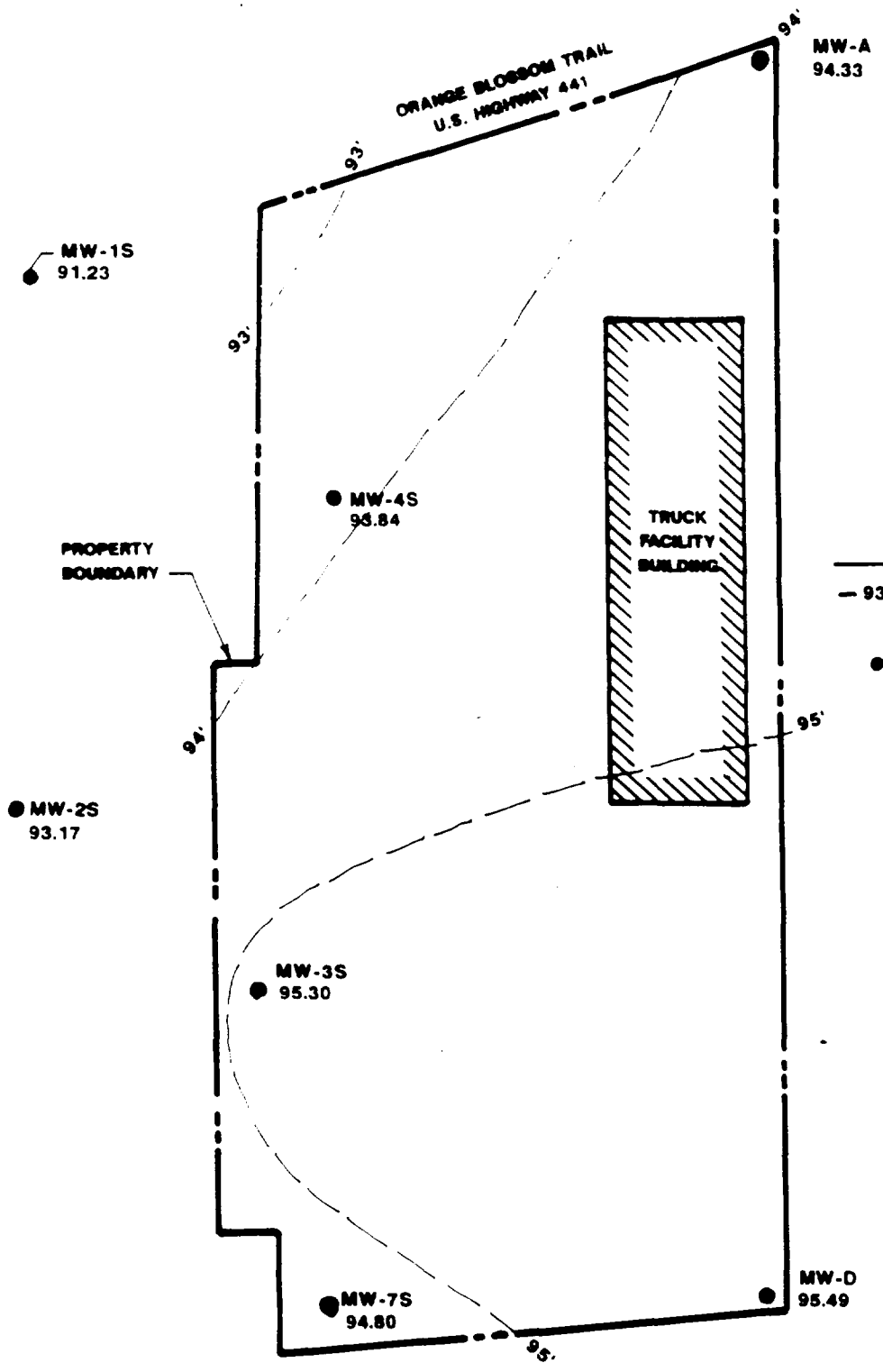
HYDROLOGY EVALUATIONS
CHEVRON ORLANDO
TASK ENVIRONMENTAL

SEF 12/30/94

94-146 10

TASK ENVIRONMENTAL, 1994

3 8 0021



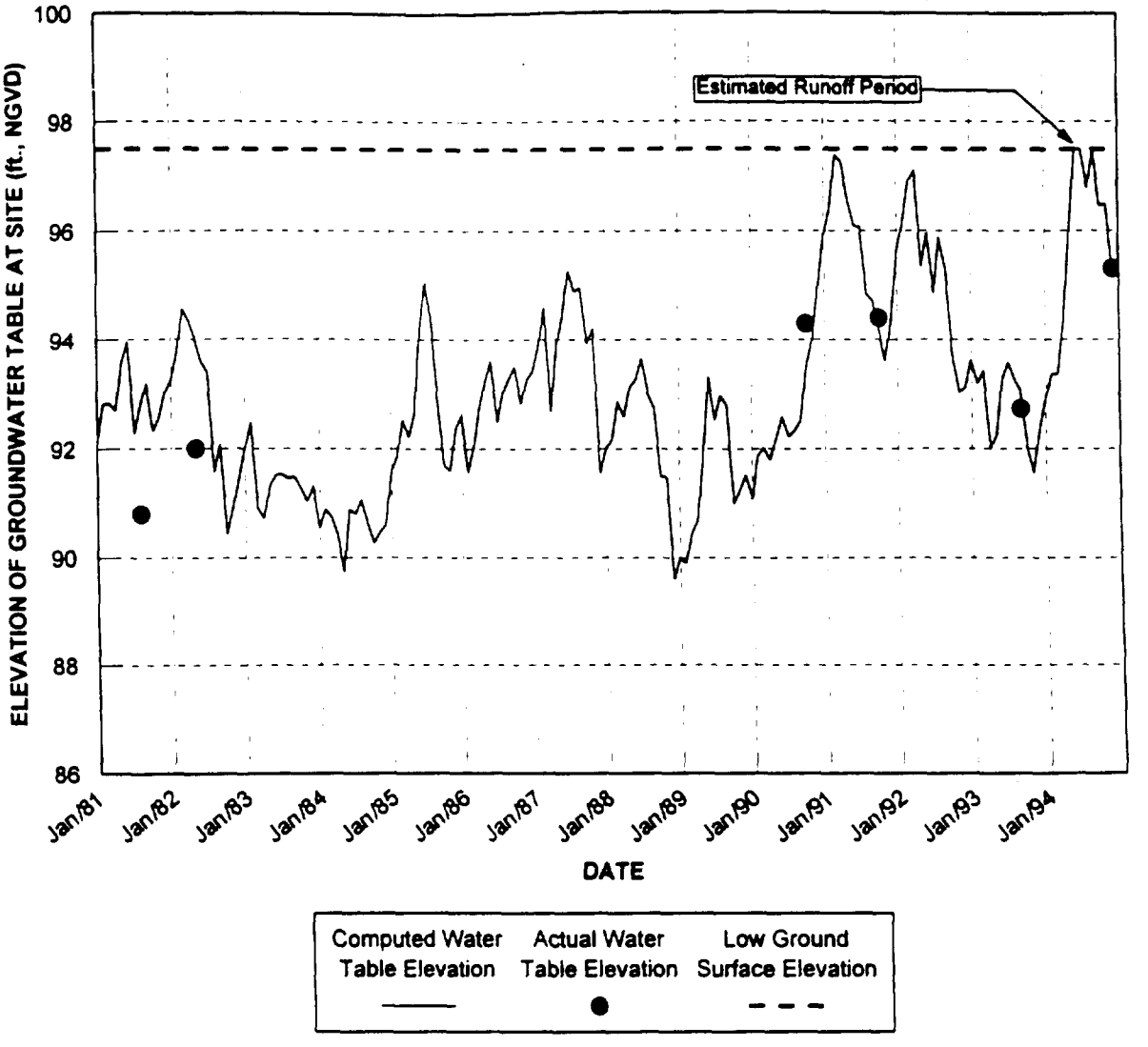
WATER TABLE ELEVATION MAP
DECEMBER 1994

Ardaman & Associates, Inc.
Geotechnical Environmental and Materials Consultants

HYDROLOGY EVALUATIONS
CHEVRON ORLANDO
TASK ENVIRONMENTAL

DRAWN BY SEF | CHECKED BY TL | DATE 12/30/94
FILE NO. 94-146 | APPROVED BY H. Stanglume | FIGURE 11

3 8 0022



MONTHLY WATER TABLE ELEVATIONS AT SITE BETWEEN JANUARY 1981 AND DECEMBER 1994

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

HYDROLOGY EVALUATIONS
CHEVRON ORLANDO
TASK ENVIRONMENTAL

DRAWN BY: CAC	CHECKED BY: HS	DATE: 3/MAR/1995
FILE NO: 94-146	APPROVED BY: H. Standard	FIGURE: 12

APPENDIX A

CUMULATIVE DEPARTURE RAINFALL DATA

ORLANDO RAINFALL RECORD FROM JANUARY 1960 UNTIL DECEMBER 1994

Date	Rainfall (inches)	Normal Rainfall (inches)	Departure from Normal Rainfall (inches)	Cumulative Departure from Normal Rainfall (inches)
Jan-81	0.21	2.30	-2.09	-12.11
Feb-81	4.36	3.02	1.34	-10.77
Mar-81	1.85	3.21	-1.36	-12.13
Apr-81	0.18	1.80	-1.62	-13.75
May-81	2.02	3.55	-1.53	-15.28
Jun-81	12.49	7.32	5.17	-10.11
Jul-81	3.53	7.25	-3.72	-13.83
Aug-81	5.60	6.78	-1.18	-15.01
Sep-81	8.26	6.01	2.25	-12.76
Oct-81	3.13	2.42	0.71	-12.05
Nov-81	2.50	2.30	0.20	-11.85
Dec-81	2.97	2.15	0.82	-11.03
Jan-82	1.72	2.30	-0.58	-11.61
Feb-82	1.34	3.02	-1.68	-13.29
Mar-82	4.85	3.21	1.64	-11.65
Apr-82	6.27	1.80	4.47	-7.18
May-82	5.29	3.55	1.74	-5.44
Jun-82	6.06	7.32	-1.26	-6.70
Jul-82	11.81	7.25	4.56	-2.14
Aug-82	5.03	6.78	-1.75	-3.89
Sep-82	6.96	6.01	0.95	-2.94
Oct-82	0.74	2.42	-1.68	-4.62
Nov-82	0.53	2.30	-1.77	-6.39
Dec-82	1.01	2.15	-1.14	-7.53
Jan-83	2.08	2.30	-0.22	-7.75
Feb-83	8.32	3.02	5.30	-2.45
Mar-83	5.37	3.21	2.16	-0.29
Apr-83	3.21	1.80	1.41	1.12
May-83	1.74	3.55	-1.81	-0.69
Jun-83	7.54	7.32	0.22	-0.47
Jul-83	6.38	7.25	-0.87	-1.34
Aug-83	4.71	6.78	-2.07	-3.41
Sep-83	5.16	6.01	-0.85	-4.26
Oct-83	3.78	2.42	1.36	-2.90
Nov-83	1.36	2.30	-0.94	-3.84
Dec-83	5.34	2.15	3.19	-0.65

ORLANDO RAINFALL RECORD FROM JANUARY 1960 UNTIL DECEMBER 1994

Date	Rainfall (inches)	Normal Rainfall (inches)	Departure from Normal Rainfall (inches)	Cumulative Departure from Normal Rainfall (inches)
Jan-84	2.01	2.30	-0.29	-0.94
Feb-84	2.73	3.02	-0.29	-1.23
Mar-84	1.85	3.21	-1.36	-2.59
Apr-84	6.21	1.80	4.41	1.82
May-84	3.20	3.55	-0.35	1.47
Jun-84	5.28	7.32	-2.04	-0.57
Jul-84	6.19	7.25	-1.06	-1.63
Aug-84	7.89	6.78	1.11	-0.52
Sep-84	6.12	6.01	0.11	-0.41
Oct-84	0.56	2.42	-1.86	-2.27
Nov-84	2.10	2.30	-0.20	-2.47
Dec-84	0.19	2.15	-1.96	-4.43
Jan-85	0.91	2.30	-1.39	-5.82
Feb-85	1.27	3.02	-1.75	-7.57
Mar-85	4.59	3.21	1.38	-6.19
Apr-85	1.69	1.80	-0.11	-6.30
May-85	3.00	3.55	-0.55	-6.85
Jun-85	4.54	7.32	-2.78	-9.63
Jul-85	7.28	7.25	0.03	-9.60
Aug-85	11.63	6.78	4.85	-4.75
Sep-85	5.45	6.01	-0.56	-5.31
Oct-85	2.55	2.42	0.13	-5.18
Nov-85	0.82	2.30	-1.48	-6.66
Dec-85	3.46	2.15	1.31	-5.35
Jan-86	7.23	2.30	4.93	-0.42
Feb-86	1.84	3.02	-1.18	-1.60
Mar-86	2.63	3.21	-0.58	-2.18
Apr-86	0.49	1.80	-1.31	-3.49
May-86	0.88	3.55	-2.67	-6.16
Jun-86	9.50	7.32	2.18	-3.98
Jul-86	5.85	7.25	-1.40	-5.38
Aug-86	5.99	6.78	-0.79	-6.17
Sep-86	4.50	6.01	-1.51	-7.68
Oct-86	5.63	2.42	3.21	-4.47
Nov-86	1.69	2.30	-0.61	-5.08
Dec-86	3.60	2.15	1.45	-3.63

ORLANDO RAINFALL RECORD FROM JANUARY 1960 UNTIL DECEMBER 1994

Date	Rainfall (inches)	Normal Rainfall (inches)	Departure from Normal Rainfall (inches)	Cumulative Departure from Normal Rainfall (inches)
Jan-87	1.27	2.30	-1.03	-4.66
Feb-87	1.74	3.02	-1.28	-5.94
Mar-87	11.38	3.21	8.17	2.23
Apr-87	0.59	1.80	-1.21	1.02
May-87	1.40	3.55	-2.15	-1.13
Jun-87	3.54	7.32	-3.78	-4.91
Jul-87	7.95	7.25	0.70	-4.21
Aug-87	6.07	6.78	-0.71	-4.92
Sep-87	8.64	6.01	2.63	-2.29
Oct-87	3.41	2.42	0.99	-1.30
Nov-87	10.29	2.30	7.99	6.69
Dec-87	0.51	2.15	-1.64	5.05
Jan-88	3.12	2.30	0.82	5.87
Feb-88	1.38	3.02	-1.64	4.23
Mar-88	6.07	3.21	2.86	7.09
Apr-88	2.02	1.80	0.22	7.31
May-88	2.82	3.55	-0.73	6.58
Jun-88	4.17	7.32	-3.15	3.43
Jul-88	9.44	7.25	2.19	5.62
Aug-88	7.94	6.78	1.16	6.78
Sep-88	5.67	6.01	-0.34	6.44
Oct-88	1.42	2.42	-1.00	5.44
Nov-88	7.44	2.30	5.14	10.58
Dec-88	1.00	2.15	-1.15	9.43
Jan-89	3.80	2.30	1.50	10.93
Feb-89	0.15	3.02	-2.87	8.06
Mar-89	1.35	3.21	-1.86	6.20
Apr-89	2.28	1.80	0.48	6.68
May-89	2.38	3.55	-1.17	5.51
Jun-89	6.79	7.32	-0.53	4.98
Jul-89	4.74	7.25	-2.51	2.47
Aug-89	6.20	6.78	-0.58	1.89
Sep-89	10.29	6.01	4.28	6.17
Oct-89	1.75	2.42	-0.67	5.50
Nov-89	1.44	2.30	-0.86	4.64
Dec-89	4.49	2.15	2.34	6.98

ORLANDO RAINFALL RECORD FROM JANUARY 1960 UNTIL DECEMBER 1994

Date	Rainfall (inches)	Normal Rainfall (inches)	Departure from Normal Rainfall (inches)	Cumulative Departure from Normal Rainfall (inches)
Jan-90	0.23	2.30	-2.07	4.91
Feb-90	4.13	3.02	1.11	6.02
Mar-90	1.92	3.21	-1.29	4.73
Apr-90	1.73	1.80	-0.07	4.66
May-90	0.55	3.55	-3.00	1.66
Jun-90	6.22	7.32	-1.10	0.56
Jul-90	6.68	7.25	-0.57	-0.01
Aug-90	3.78	6.78	-3.00	-3.01
Sep-90	2.46	6.01	-3.55	-6.56
Oct-90	2.10	2.42	-0.32	-6.88
Nov-90	1.05	2.30	-1.25	-8.13
Dec-90	0.83	2.15	-1.32	-9.45
Jan-91	2.37	2.30	0.07	-9.38
Feb-91	0.98	3.02	-2.04	-11.42
Mar-91	6.66	3.21	3.45	-7.97
Apr-91	7.72	1.80	5.92	-2.05
May-91	9.48	3.55	5.93	3.88
Jun-91	5.98	7.32	-1.34	2.54
Jul-91	10.78	7.25	3.53	6.07
Aug-91	7.13	6.78	0.35	6.42
Sep-91	4.53	6.01	-1.48	4.94
Oct-91	4.76	2.42	2.34	7.28
Nov-91	0.27	2.30	-2.03	5.25
Dec-91	0.24	2.15	-1.91	3.34
Jan-92	1.35	2.30	-0.95	2.39
Feb-92	2.42	3.02	-0.60	1.79
Mar-92	3.67	3.21	0.46	2.25
Apr-92	9.10	1.80	7.30	9.55
May-92	1.19	3.55	-2.36	7.19
Jun-92	8.68	7.32	1.36	8.55
Jul-92	2.60	7.25	-4.65	3.90
Aug-92	8.03	6.78	1.25	5.15
Sep-92	7.13	6.01	1.12	6.27
Oct-92	5.17	2.42	2.75	9.02
Nov-92	2.74	2.30	0.44	9.46
Dec-92	0.88	2.15	-1.27	8.19

ORLANDO RAINFALL RECORD FROM JANUARY 1960 UNTIL DECEMBER 1994

Date	Rainfall (inches)	Normal Rainfall (inches)	Departure from Normal Rainfall (inches)	Cumulative Departure from Normal Rainfall (inches)
Jan-93	4.89	2.30	2.59	10.78
Feb-93	1.48	3.02	-1.54	9.24
Mar-93	6.26	3.21	3.05	12.29
Apr-93	1.78	1.80	-0.02	12.27
May-93	2.32	3.55	-1.23	11.04
Jun-93	4.47	7.32	-2.85	8.19
Jul-93	6.49	7.25	-0.76	7.43
Aug-93	5.95	6.78	-0.83	6.60
Sep-93	5.35	6.01	-0.66	5.94
Oct-93	4.61	2.42	2.19	8.13
Nov-93	0.17	2.30	-2.13	6.00
Dec-93	0.76	2.15	-1.39	4.61
Jan-94	4.00	2.30	1.70	6.31
Feb-94	3.58	3.02	0.56	6.87
Mar-94	1.21	3.21	-2.00	4.87
Apr-94	3.03	1.80	1.23	6.10
May-94	2.87	3.55	-0.68	5.42
Jun-94	10.28	7.32	2.96	8.38
Jul-94	13.27	7.25	6.02	14.40
Aug-94	6.23	6.78	-0.55	13.85
Sep-94	7.84	6.01	1.83	15.68
Oct-94	5.18	2.42	2.76	18.44
Nov-94	7.32	2.30	5.02	23.46
Dec-94	3.85	2.15	1.70	25.16